

**A Dissertation on**  
**A COMPARATIVE STUDY BETWEEN ENDOSCOPIC**  
**CARTILAGE MYRINGOPLASTY VERSUS ENDOSCOPIC**  
**TEMPORALIS FASCIA MYRINGOPLASTY**

Submitted to the  
**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY**

In partial fulfilment of the requirements

For the award of the degree of

**M.S.BRANCH IV**  
**(OTORHINOLARYNGOLOGY)**



**GOVERNMENT STANLEY MEDICAL**  
**COLLEGE & HOSPITAL**  
**THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY,**  
**CHENNAI, TAMILNADU**

**APRIL 2014**

## **DECLARATION**

I, **DR. CHOZHAN. P**, solemnly declare that the dissertation, titled **“A COMPARATIVE STUDY BETWEEN ENDOSCOPIC CARTILAGE MYRINGOPLASTY VERSUS ENDOSCOPIC TEMPORALIS FASCIA MYRINGOPLASTY”** is a bonafide work done by me during the period of MARCH 2013 to SEPTEMBER 2013 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of **PROF.DR.M.RAMANI RAJ, M.S., D.L.O.**, Professor Department of Otorhinolaryngology, Government Stanley Medical College and Hospital, Chennai.

This dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.S. degree examinations in Otorhinolaryngology to be held in April 2014.

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## **CERTIFICATE**

This is to certify that this dissertation on “**A COMPARATIVE STUDY BETWEEN ENDOSCOPIC CARTILAGE MYRINGOPLASTY VERSUS ENDOSCOPIC TEMPORALIS FASCIA MYRINGOPLASTY**” presented here in by DR. CHOZHAN. P, is the original work done in the Department of Otorhinolaryngology, Government Stanley Medical College and Hospital, Chennai in partial fulfillment of the regulations of the Tamilnadu DR. M.G.R Medical University, Chennai for the award of M.S (Otorhinolaryngology), under the guidance and supervision during the academic year 2011 – 2014.

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**A COMPARATIVE STUDY BETWEEN ENDOSCOPIC  
CARTILAGE MYRINGOPLASTY VERSUS ENDOSCOPIC  
TEMPORALIS FASCIA MYRINGOPLASTY**

## *ABSTRACT*



## **ABSTRACT**

This is a study of about a comparative study between endoscopic cartilage myringoplasty versus endoscopic temporalis fascia myringoplasty in patients with chronic otitis media with retraction and central perforation with mild to moderate Eustachian tube dysfunction. The surgery was compared with respect to the reperforation, retraction and improvement in the hearing level. The patients were followed up for a period of six months. The result was statistically correlated and the final report came as both the surgeries were equally effective in successful closure of the perforation and decreased incidence of retraction.

## *INTRODUCTION*

## **INTRODUCTION**

Chronic otitis media is a chronic inflammation of the middle ear cleft which presents with persistent otorrhoea through a perforated tympanic membrane for a period of more than 3 months. To improve the hearing and for the successful closure of tympanic membrane perforation for cases with retraction and central perforation many surgical procedures are offered by otologists. Cartilage myringoplasty and temporalis fascia myringoplasty are frequently done procedures. This study conducted at the Department of ENT, Stanley Medical College, Chennai, discusses the effectiveness of these two surgical procedures in terms of hearing improvement, graft uptake, reperforation and retraction of tympanic membrane in carefully selected patients in inactive cases of chronic otitis media with retraction and central perforation, and mild to moderate Eustachian tube dysfunction.

## **AIM OF THE STUDY**

To compare the efficacy of two surgical procedures, Endoscopic cartilage myringoplasty and Endoscopic temporalis fascia myringoplasty in inactive cases of chronic otitis media with retraction and central perforation with mild to moderate Eustachian tube dysfunction, with a follow up period of 6 months.

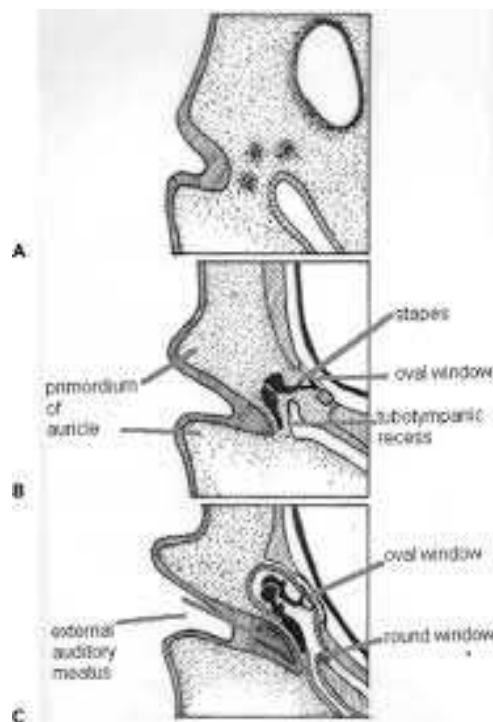
## **REVIEW OF LITERATURE**

### **DEVELOPMENT OF EAR:**

The human ear begins to develop from the 4<sup>th</sup> week of the embryonic life.

#### **External ear:**

The ear develops from six auricular hillocks of His at the 6<sup>th</sup> week of embryonic life from the first and the second branchial arches. The external auditory canal is formed by deepening of the groove between these two arches. The trigeminal nerve innervates the first arch and the facial nerve innervates the second arch.



### **EXTERNAL AUDITORY CANAL:**

The external auditory canal is approximately 2.4cm in length and serves as a conduit for sound transmission to the middle ear. It also functions to protect the middle ear and inner ear from foreign bodies and fluctuations in environmental temperature. Its lateral one third is completed by elastic cartilage oriented in an upward and backward direction. Its anterior aspect is pierced by 2 to 3 fissures known as fissures of Santorini. The medial two thirds of the external auditory canal is osseous and is oriented in a downward and forward direction. Hence, the ear must be pulled upward and backwards to achieve the alignment during otoscopic examination. The narrowest portion of the external auditory canal is the isthmus which is located just medial to the junction of the bony and the cartilaginous canals. Because of this angulation, the tympanic membrane is approximately 6mm longer anteroinferiorly than posterosuperiorly.

### **Middle ear:**

Development: Middle ear develops from the extension of foregut into anlage of temporal bone. The expanding 1<sup>st</sup> pharyngeal pouch forms multiple cul-de-sac that coalesce to form common air spaces.

The middle ear cleft consists of

- 1) Eustachian tube,
- 2) Tympanic cleft and
- 3) Mastoid air cell system.

Tympanic cavity is an irregular air filled space within the temporal bone and it contains auditory ossicles and their attached muscles. It is made up of 6 sides.

1. Lateral wall,
2. Anterior wall,
3. Roof,
4. Medial wall,
5. Posterior wall and
6. Floor.

Tympanic membrane forms the lateral wall of tympanic cavity. Pars flaccida is the portion of the tympanic membrane which lies above the anterior and posterior malleal folds.

There are 2 openings present in the bony tympanic cavity's lateral wall.

They are,

1. Iter chordae posterior through which chorda tympani nerve enters into the tympanic cavity
2. Iter chorde anterior through which chorda tympani nerve leaves the tympanic cavity.

***Tympanic membrane:***

The tympanic membrane is a thin nearly oval disc. The longest diameter is posterosuperior to anteroinferior of about 9-10mm and perpendicular to this, the shortest diameter is of about 8-9mm. In the adult, it is angulated approximately 140 degree with respect to the superior wall of the external auditory canal. The malleal prominence, a projection formed by the lateral process of the malleus is located at the superior end of the manubrium of the malleus. The circumference of the tympanic membrane forms



a thick cartilaginous ring, the tympanic annulus, which occupies the tympanic sulcus (only pars tensa has tympanic annulus).



Otoscopic view of the tympanic membrane

Tympanic membrane has 3 layers.

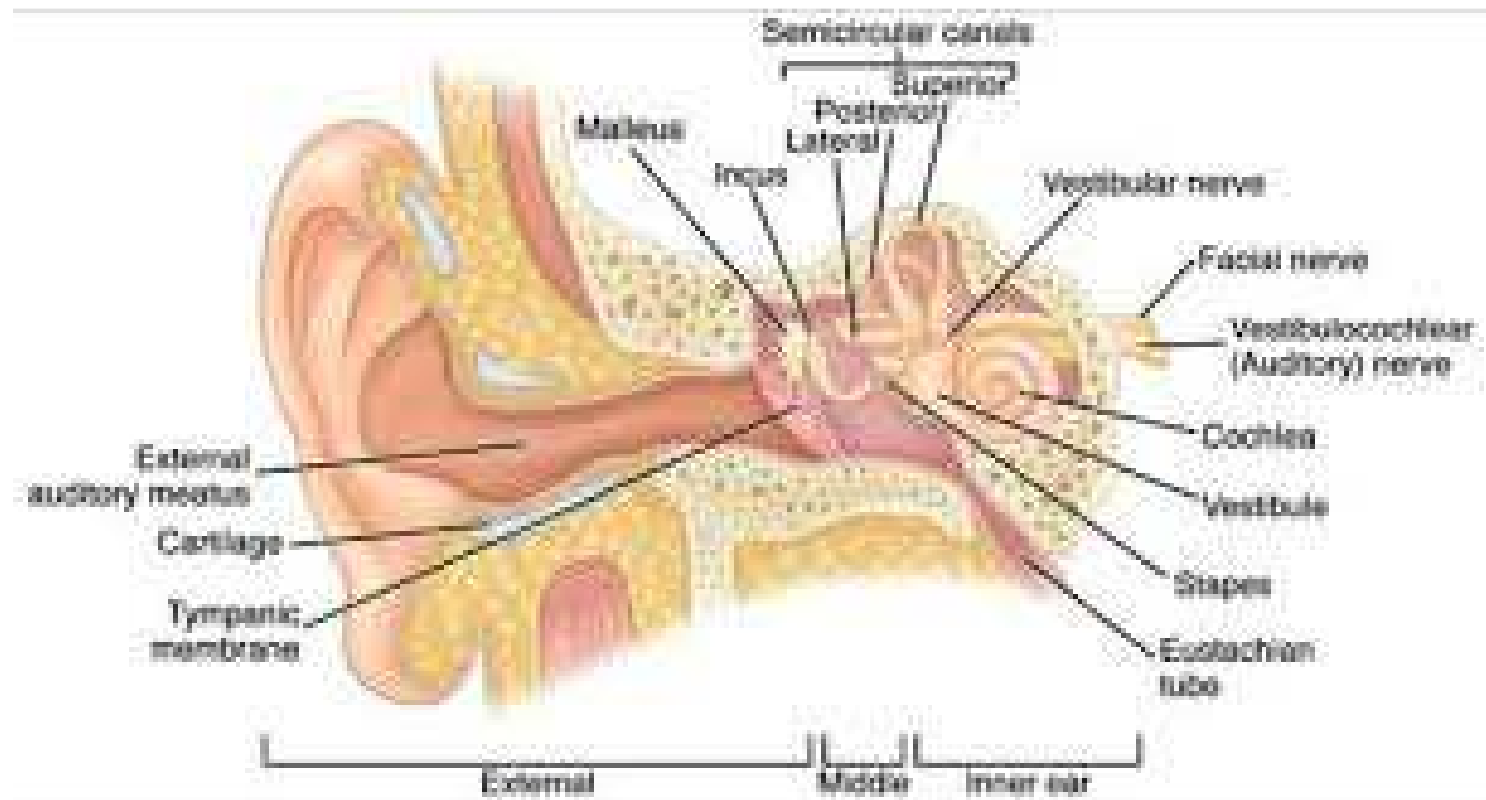
Outer epidermis,

Middle fibrous and

Inner mucous layer.

## **Outer epidermis**

- The outer epidermis has no nerve endings and no melanin.
- Epidermis is divided into 4 layers (from outwards to inwards).
  - ***Stratum corneum:*** 1-6 layers of cells, intercellular desmosomes (organelle is absent).
  - ***Stratum granulosum:*** consists of 3 layers of smooth borders with intercellular bridges which is called desmosome, and keratohyaline and lamellar granules with absent organelles.
  - ***Stratum spinosum:*** 2-3 layers of cells, desmosomes and organelles present.
  - ***Stratum basale:*** 1 layer of cells and separated by fibrous middle layer by lamina propria.



External ear, middle ear and inner ear

### **Middle Fibrous layer (Lamina propria):**

- Collagen fibrils are scanty in pars flaccida. In pars tensa, the fibres are radially oriented laterally and deeper layers are parabolic, transverse and circular
- Deeper layers have nerves and small arteries. In Pars flaccida, fibrous layer is less marked and randomly oriented.

### **Inner mucosal layer:**

- The medial free surface is lined with columnar epithelium with microvilli with 9+2 arrangement like the rest of the respiratory epithelium. These cilia are patchy in distribution.

### **Blood supply of TM:**

Deep auricular branches of maxillary artery, anterior tympanic branch of maxillary artery, stylomastoid branches of post auricular artery

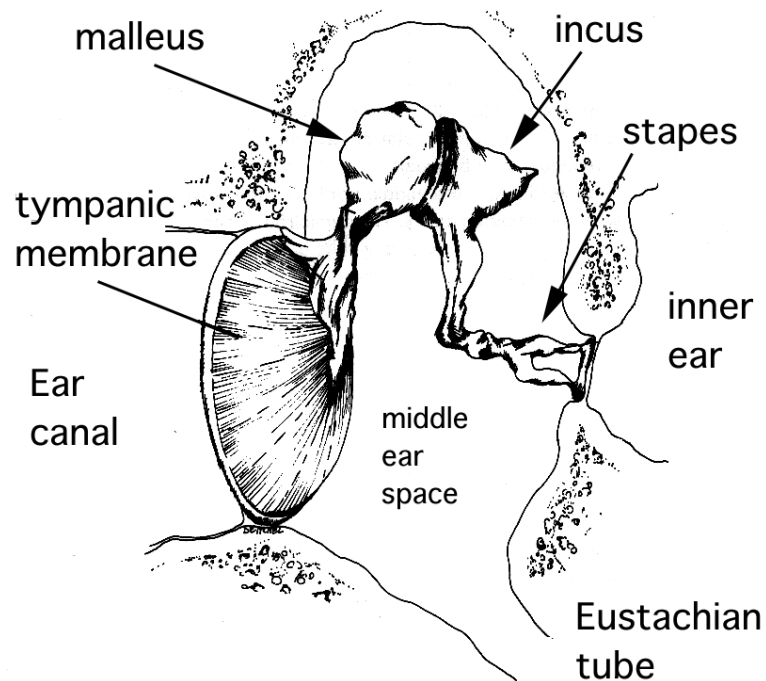
### **Nerve supply of tympanic membrane:**

5<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>: Auriculotemporal nerve - 5<sup>th</sup> Cranial Nerve, Tympanic branch of 9<sup>th</sup> Cranial Nerve and Auricular branch of 10<sup>th</sup> Cranial Nerve.

### **Medial wall:**

The promontory lies in the centre of the medial wall. It is the basal turn of the cochlea. Posterosuperior to the promontory, a kidney shaped opening called fenestra vestibuli (oval window) is connected to the vestibule via scala vestibuli. It is closed by Stapes footplate. It is surrounded by annular ligament. It is 3.25mm long and 1.75mm wide.

Above the oval window is facial nerve and inferiorly is the promontory.



Round window is situated below and behind the oval window which is closed by secondary tympanic membrane. Subiculum separates these two windows. The round window niche is most commonly triangular in shape, with anterior, posterosuperior and posteroinferior walls. The posterosuperior and posteroinferior walls meet posteriorly and lead to the sinus tympani. The sinus tympani lies between the ponticulus which bridges the gap between the pyramidal eminence and the promontory superiorly, and the subiculum inferiorly.

Secondary tympanic membrane has 3 layers:

- Inner mesothelial layer
- Middle fibrous layer and
- Outer mucosal layer

Only outer mucosal layer has nerves and capillaries. It is about 2.3mm long and 1.87mm wide. The inner layer is nothing but the cell layer which is continuous with that of the scala tympani. The membrane of the fenestra cochleae forms part of the floor of the scala tympani. The scala tympani terminates medial and behind the round window membrane. The vestibular structure which is closest to the membrane is the ampulla of the posterior semicircular canal

and the singular nerve which is parallel and 1mm beyond the posterior part of medial surface of membrane, which is the singular nerve's surgical landmark. The facial nerve canal lies above the oval window and the promontory in an anterior to posterior way. The lateral surface of the canal is smooth(deficient occasionally) and has a processus cochleariformis in the front of the lateral surface of the facial canal. The processus cochleariformis is a spoon shaped hook like projecting bone where the tendon of tensor tympani muscle gets attached and takes a 90 degree turn laterally to get attached to the malleus neck. Posterior to the oval window, the facial nerve takes an inferior turn to the posterior wall of tympanic cavity.

### **Posterior wall:**

It is narrow inferiorly than superiorly. Above there is an opening and it is called aditus which opens into the mastoid antrum. Fossa incudis is situated just below the aditus. The fossa incudis contains a ligament which connects the short process of the incus with it. Pyramid is a prominent bony projection which is related to the fossa incudis inferiorly and chorda tympani nerve laterally. Between the pyramid and the tympanic annulus is the facial recess. Stapedius muscle is contained within the pyramid. The facial recess

is bounded medially by the pyramid and laterally by the tympanic annulus.

We can reach the middle ear without disturbing the tympanic membrane via the gap between the chorda tympani nerve and the facial nerve.

### **Anterior wall:**

The lower part is related to a thin bone of the carotid canal. This is pierced by upper and lower caroticotympanic nerves with the sympathetic nerve to the tympanic plexus.

The upper part has 2 parallel tunnels. The upper tunnel contains tensor tympani muscle. The lower tunnel leads into bony part of the Eustachian tube.

### **Roof:**

The roof is formed by the tegmen tympani and comprises partly by the squamous bone and the petrous bone.

### **Floor:**

It is covered by a thin piece of bone separating the jugular bulb. Occasionally, the bony floor is dehiscent. An opening is



present between the junction of the floor and the medial wall through which the glossopharyngeal nerve gives a tympanic branch.

**Contents of middle ear:**

- 1 nerve: chorda tympani,
- 2 muscles: tensor tympani and stapedius muscle,
- 3 bones: malleus, incus and stapes,
- Tympanic plexus of nerves and
- Ear ossicles.

**Malleus:** The most lateral of the ossicles is the malleus. It consists of an head, neck , anterior process, lateral process and the handle. It is attached to the walls by the anterior malleal ligament to the petrotympanic fissure. On its thinner medial aspect, the chorda tympani nerve runs anteriorly to enter the Glassserian fissure. The malleus lateral process has a cartilaginous cap which gets adhered to the pars tensa of the tympanic membrane. The lower end of the handle of the malleus is firmly attached to the tympanic membrane as the pars propria splits to envelop it to form the umbo. The malleus has five ligaments, one joint, the tendon of tensor tympani and the tympanic membrane. Three of them are

- The anterior suspensory ligament,
- The lateral suspensory ligament and
- The superior suspensory ligament,

which connects the space between the tegment tympani and the head of the malleus.

### **Incus:**

The incus is the biggest of the ear ossicles which has a body, a long process a short process and a lenticular process. The body of the incus lies in the epitympanum along with the malleus head. The short process of the incus projects behind to occupy the fossa incudis. The long process reaches inferiorly paralleling the manubrium to end in the lenticular process. The convex surface of this process joins with the concave surface of the head of the stapes. The long process of the incus is highly susceptible to osteitic resorption caused by chronic otitis media.

### **Stapes:**

The stapes is the smallest of the ear ossicles. It has a head, a footplate and two legs, anterior and posterior. There is an irregular area near the superior aspect of the posterior crus to which is

attached the stapedius tendon. The footplate in association with the annular ligament seals the oval window. The head joins with the incus lenticular process.

### **Stapedius:**

It originates from the pyramid and inserts onto stapes neck and is supplied by the 7<sup>th</sup> cranial nerve.

### **Tensor tympani:**

It originates from the bony part of the Eustachian tube. It enters a spoon shaped processus cochleariformis and takes a 90 degree turn laterally and inserts onto the upper part of the manubrium of the malleus. It is innervated by the 5<sup>th</sup> Cranial nerve. The chorda tympani nerve enters iter chordae posterior and travels along the medial part of tympanic membrane and is present medial to the handle of malleus and exits through iter chordae anterior and later enters the Glasserian fissure.

### **Tympanic plexus:**

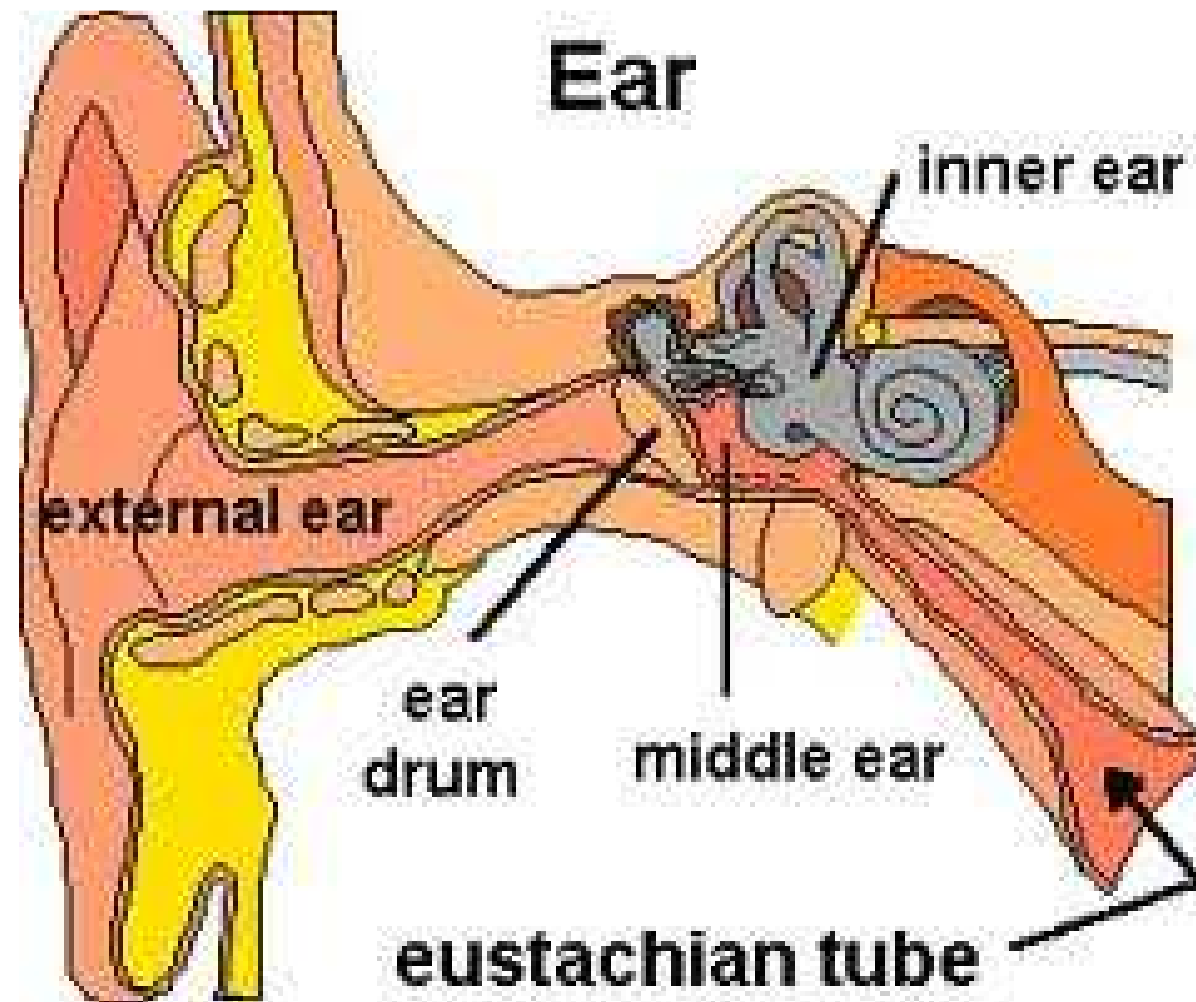
It is arranged by the Jacobson's nerve which is a branch of glossopharyngeal nerve and by caroticotympanic nerve, arising from sympathetic plexus encircling the internal carotid artery. This

plexus provides divisions of nerves to the mucosa which lines the tympanic cavity, lesser superficial petrosal nerve, auditory tube, mastoid antrum and air cells, which receives parasympathetic fibres from 9<sup>th</sup> Cranial nerve and parasympathetic fibres from 7<sup>th</sup> Cranial nerve through geniculate ganglion and branches joining greater superficial petrosal nerve.

**Blood supply of middle ear cavity:**

- Anterior tympanic division, a branch of maxillary artery gives blood supply to the tympanic membrane, ossicles, front part of the tympanic cavity.
- Stylomastoid division, a branch of posterior auricular artery gives blood supply to the posterior portion of the tympanic cavity and the stapedius.
- Mastoid branch of stylomastoid artery supplies the mastoid air cells.
- Petrosal division of middle meningeal artery supplies the roof of the epitympanum.
- Superior tympanic division of the middle meningeal artery supplies the tensor tympani muscle.

- Inferior tympanic division of ascending pharyngeal artery supplies the mesotympanum.
- Branches from the artery of pterygoid canal supplies the mesotympanum and the hypotympanum.
- Tympanic branches of the internal carotid artery supplies the mesotympanum and the hypotympanum.



### **Eustachian tube:**

It is a tube connecting the middle ear cavity with the lateral wall of the nasopharynx. It is about 36mm in length, laterally bony and medially fibrocartilagenous. Bony part is about 12mm in length and wide at the lateral tympanic end. The isthmus is the narrowest part with 2mm diameter. It is separated by tensor tympani muscle superiorly and the internal carotid artery medially. Cartilagenous part is 24 mm long. The cartilage is attached to the skull base in a sulcus between the petrous portion of the temporal bone and the greater wing of the sphenoid bone. The nasopharyngeal opening is just 1cm to 1.25cm posteroinferior to the inferior turbinate at its posterior end. It is surrounded by the tubal elevation. Posterior to the Torus tubarius is a recess called the fossa of Rosenmüller.

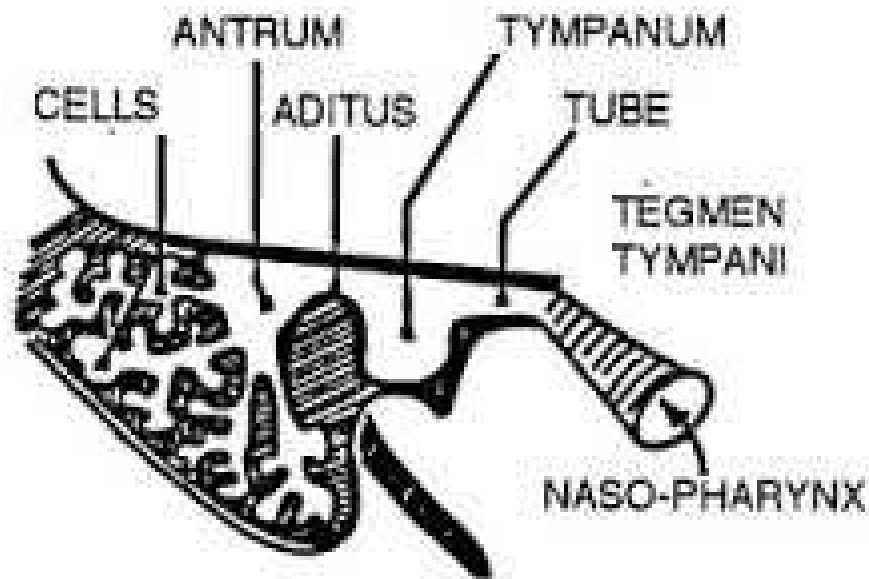
Muscles of the auditory tube:

1. Tensor tympani,
2. Salpingopharyngeus and
3. Levator veli palatini muscle.

**Mastoid region:**

At birth the mastoid has a single cavity consisting of the antrum and small adjacent mastoid. It occupies a superficial position and is surrounded by diploic bone. In adult life, the normal mastoid may be fully pneumatized, diploic, or sclerotic. The anterolateral portion of the mastoid arises from the temporal bone's squamous portion, the posteromedial portion, including the mastoid tip, arises from the petrous part. In most mastoids, the plane of junction of these two parts is marked internally by an incomplete plate of bone, the petrosquamous septum, also known as Koerner's septum. The mastoid antrum area is a large superior central space which communicates with the epitympanic space of the middle ear via the aditus ad antrum.



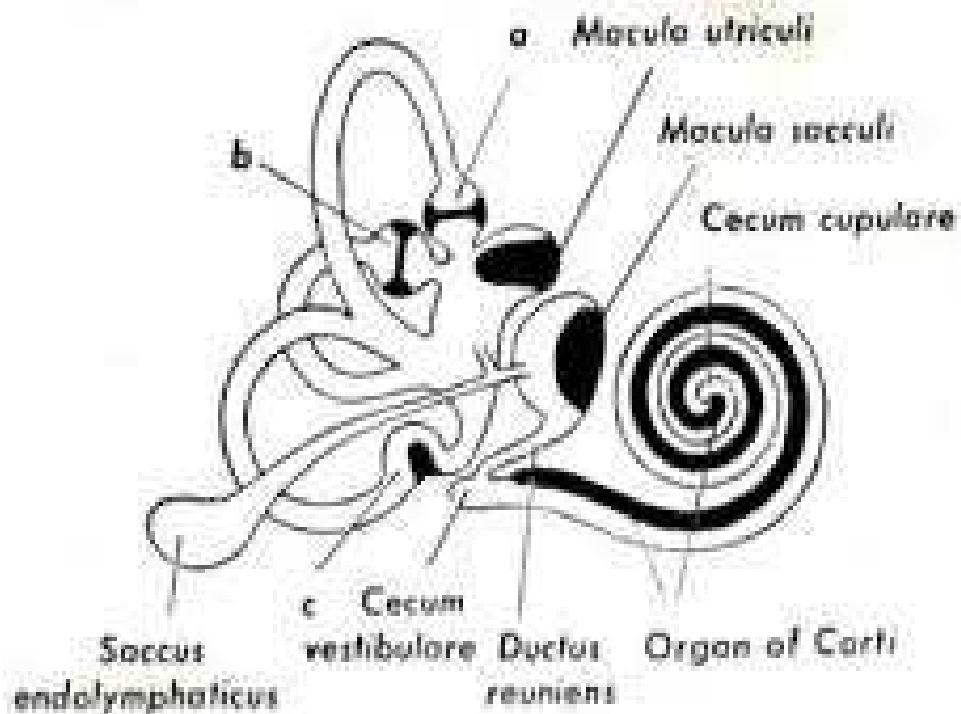


It is the largest and permanent air cell of mastoid. It is about 1ml in volume, 14mm long, 9mm tall and 7mm wide. Lateral wall corresponds to squamous portion of temporal bone, supra meatal triangle or Mc. Ewen's triangle. Boundaries of the Mc. Ewen's triangle :

- Superiorly by supramastoid crest,
- Anteriorly by the posterior canal wall and
- Posteriorly by the vertical tangent along the posterior margin of the external auditory meatus.

This area can be palpated through the cymba concha.

## INNER EAR:



The Inner Ear has two parts,

1. Membranous labyrinth, which is derived from the ectoderm and
2. Bony labyrinth, which is derived from the mesoderm and neural crest.

The membranous labyrinth develops from the otic placode which is a thickening of the ectoderm adjacent to the hindbrain. This otic placode invaginates and forms an otic cup. At the end of the

4<sup>th</sup> week of intrauterine life, the edges of the otic cup fuse together to form the otocyst. A few of the otic epithelial cells in the the otic cup and the otocyst separate from the epithelium and join to form the neurons of the 8<sup>th</sup> cranial nerve ganglion. These neurons innervate sensory organs within the inner ear. A diverticulum develops in the otocyst which elongates to form the endolymphatic duct and sac. The remaining portion of the otocyst enlarges to form a ventral saccular and cochlear region. The dorsal region develops into the utricle and three semicircular ducts. The anterior and posterior semicircular canals develop from a vertical outgrowth in the dorsal region of the otocyst. The horizontal duct develops from a horizontal outgrowth in the lateral portion of the otocyst.

### **The bony labyrinth:**

The long axis of the bony labyrinth, measures 20mm in length roughly parallels the posterior surface of the petrous pyramid.

Its components are

- The cochlea,
- The vestibule and
- The semicircular canals.

***Vestibule:***

Vestibule is a central chamber. At the posterosuperior aspect of its medial wall is a depression known as the elliptical recess which accommodates a part of the utricular macula. The spherical recess is a similar depression for the saccular macula located anteroinferiorly. The vestibular crest, an oblique elevation is present between these two recesses. There are discrete openings in the bony walls of the vestibule. The opening for the cochlea lies anteriorly, while the openings for the semicircular canals are located posteriorly. The oval window is an opening on the lateral wall adjoining the tympanic cavity. The vestibular aqueduct with its contained endolymphatic duct opens into the posteroinferior aspect of the vestibule.

***The semicircular canals:***

The osseous semicircular canals are the horizontal canal, posterior canal and superior canal which are situated posteriorly relative to the vestibule. Each canal expands to double its diameter at its osseous ampulla where it communicates with the vestibule. The nonampullated ends of the posterior and superior canals fuse, forming the crus commune, while the nonampullated end of the

lateral canal is independent. Thus, the vestibule has five apertures for the three semicircular canals.

### ***The membranous labyrinth:***

The membranous labyrinth is encased within the bony labyrinth and is surrounded by the perilymphatic space with its fluid, blood vessels and supporting connective tissue.

The constituents of the membranous labyrinth are

- The cochlear duct,
- The three semicircular ducts and their ampullae,
- The otolithic organs (the utricle and the saccule) and
- The endolymphatic duct and sac. This system of epithelial lined channels and spaces is filled with endolymph (Scarpa's fluid), the utricular duct, saccular duct, and the ductus reuniens which interconnects the major structures.

### ***Cochlea:***

The cochlea is a snail shaped structure which has a spiral configuration with two and a half turns. The central portion of the spiral is called the modiolus. The portion of the cochlea that is closest to the oval window is the base, whereas the portion of the

cochlea that is farthest away from the oval window is the apex. The cochlea has three compartments:

- The scala tympani,
- The scala vestibuli and
- The scala media.

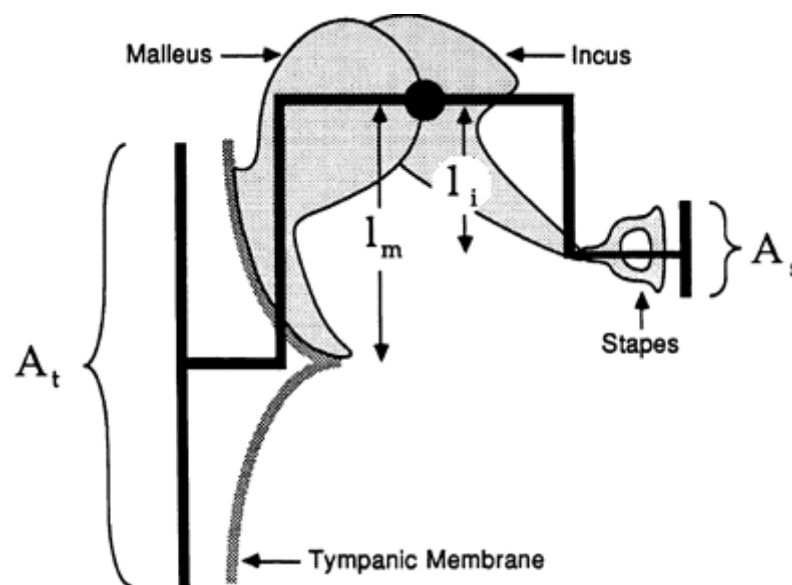
The basilar membrane lies between the scala tympani and the scala media, and the Reissner's membrane lies between the scala media and the scala vestibuli. The scala tympani and the scala vestibuli communicate with each other at the helicotrema. In the scala media, the Organ of Corti rests on the basilar membrane. The basilar membrane and the Organ of Corti are referred to as the cochlear partition. The Organ of Corti has the outer hair cells and the inner hair cells. The inner hair cells are arranged in a single row and the outer hair cells are in a rows of three. These hair cells have hairlike projections called stereocilia which is responsible for the signal transduction in hair cells. Perilymph fills the scala tympani and scala vestibuli, which resemble the extracellular fluid in composition. The scala media is filled with endolymph which resemble intracellular fluid in composition. The electrolyte

composition of the scala media causes the endocochlear potential which is +60 to 100+mV relative to the perilymph.

### **PHYSIOLOGY OF MIDDLE EAR:**

Sound causes tympanic membrane to vibrate and the malleus is set into motion which causes the entire ossicular chain to vibrate and the sound is transmitted to the inner ear via the footplate of the stapes. This pathway of sound transmission is called ossicular coupling. Sound transmission in the absence of ossicular chain is called acoustic coupling, and the difference between the ossicular coupling and acoustic coupling is 60 decibel. If the sound stimulus strikes the inner ear fluid directly, most of the acoustic energy is reflected, as the impedance of fluid is more than the air.

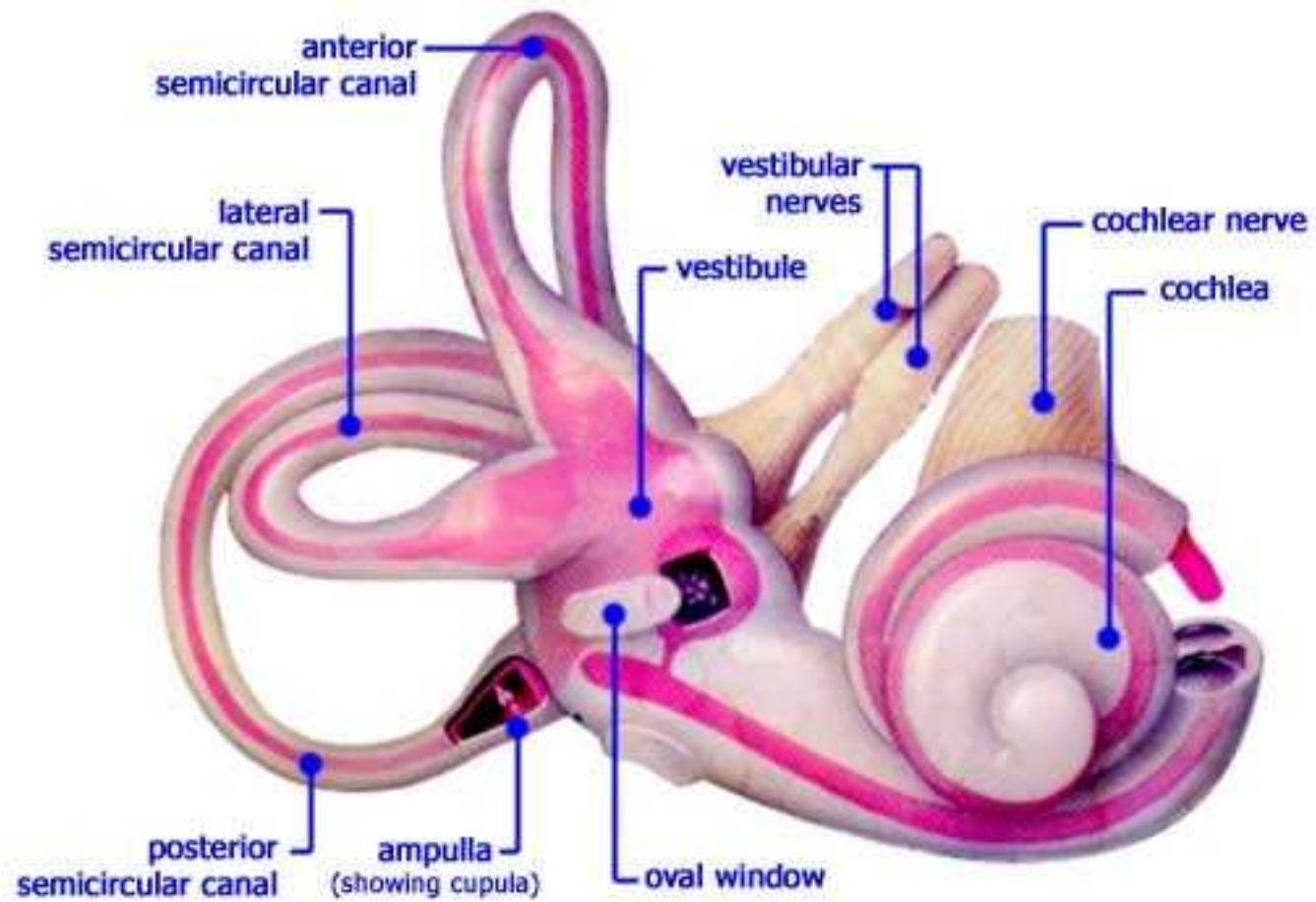
Diagram of impedance matching mechanism:



Impedance matching is done by two factors:

1. **Area ratio** : Tympanic membrane's area / area of foot plate of stapes = 20% (69/3.4mm<sup>2</sup>). Tympanic membrane's area is about 20 times greater than the foot plate's area. If all the force applied to the tympanic membrane were to be transferred to the stapes footplate, the force per unit area would be 20 times larger (26 decibel) on the footplate than on the tympanic membrane.
2. **Lever ratio**: Length of malleus / length of incus = 1.31:1. Because the handle of malleus is slightly longer than the long process of incus, small force applied on the long handle results in a larger force on the short arm of lever (long process of incus). In humans, the lever ratio is 1.31:1, which gains 2.3 decibel. So theoretically, 28 decibel is gained in the middle ear. But, in reality, gain is only 20 decibel. This is because, the tympanic membrane does not move as a rigid diaphragm. The effective area of tympanic membrane involved with this impedance matching mechanism is smaller than its total area.





**Inner Ear**

**Acoustic reflex:** When a strong acoustic stimulus is presented to the ear, afferent sensory fibres beginning in the inner hair cells travel through the brainstem with both ipsilateral and contralateral projections resulting in feedback efferent stimulus through the facial nerve and contraction of both the stapedius muscles on each side. The contractile force of the stapedius muscle is perpendicular to the movement of the stapes, by increasing the acoustic impedance of the middle ear transformer, thereby decreasing the sound energy transmitted to the cochlea. The acoustic reflex filters low frequency sounds less than 1000Hz, but has no effect on sounds greater than 2000Hz. This will result in masking of low frequency background noise while transmitting the high frequency range of speech. The tensor tympani muscle plays a minor role in increasing acousting impedance in the middle ear. It pulls the tympanic membrane medially, decreasing its compliance. The two factors that help in the transmission of sound energy are the normal Eustachian tube function and gas exchange in the middle ear mucosa.

Middle ear mucosa has a well developed capillary structure close to its surface. This helps in gas exchange. In normal conditions, the middle ear pressure is equal to atmospheric pressure, approximately 760mmHg at sea level. Nitrogen levels in middle ear gas is higher than that of the venous blood. This gradient results in gas exchange between the middle ear space and the venous blood. The rate of nitrogen diffusion into venous blood is however very slow. The absorption of nitrogen results in the middle ear negative pressure. This is equalized by opening of the Eustachian tube. Prolonged Eustachian tube dysfunction hampers this mechanism which results in middle ear negative pressure, transudation of fluid and the development of a middle ear effusion, and increases the middle ear acoustic impedance. When sound energy travels through the ear, it causes the stapes footplate to vibrate. The vibration of the stapes footplate produces a compressional wave in the perilymph, which travels to the scala vestibuli, at the helicotrema,, and out across the scala tympani outwards towards the round window. An inward motion of the stapes results in the outward movement of the round window. When the Organ of Corti and the basilar membrane are deflected in response to the compressional wave, it produces a shearing force between the tectorial membrane and the stereocilia of

the hair cells. This shearing forces produce deflection of stereocilia towards the direction of the tallest row resulting in opening of the stretch sensitive cationic channels located on the stereocilia. The opening of these stretch sensitive cationic channels causes an influx of cationic current, which results in hair cells depolarization. When inner hair cells are depolarised, it opens the voltage gated calcium channels. The resulting calcium current triggers neurotransmitter release across the synapse which results in activation of the auditory nerve fibres.

## **PATHOLOGY**

Perforation of the tympanic membrane with a persistent drainage from the middle ear cleft is known as chronic otitis media (i.e, lasting more than 6-12 weeks).

The chronically draining ear in chronic otitis media can be difficult to treat. Chronic otitis media is started with an acute infectious episode. The pathology starts with inflammation and irritation of the mucosa of the middle ear. The response causes oedema in the mucosa. The inflammation causes ulcer of the mucosa and later the epithelial lining breakdown. The body attempts at resolution of inflammatory injury or the infection by the

formation of granulation tissue, which later develops into polyp. This polyp may present in the external auditory canal. The cycle of ulceration, inflammation, infection, and formation of granulation tissue may ultimately destroy the bony margin resulting in complications. The perforations of the tympanic membrane are described according to their anatomic location and are separated into two categories central perforation and marginal perforation. Central perforations involve the pars tensa and are circumferentially surrounded by residual tympanic membrane. Subtotal perforations are described as large defects in which there is only a narrow rim of residual pars tensa near the annulus. Central perforations are rarely associated with cholesteatoma and for this reason have generally been considered safe ear. Marginal perforations have no remnant of tympanic membrane adjacent to the bone of the posterior canal wall. As a result the bony external auditory canal wall, attic, antrum, and mastoid air cells can be involved with inflammation. Hence this condition has been referred to as an atticoantral disease.

## **CHRONIC OTITIS MEDIA:**

### **Mucosal disease:**

Chronic otitis media mucosal inactive type and chronic otitis media active mucosal type.

### **Squamous disease:**

Chronic otitis media squamous inactive type and chronic otitis media active squamous type.

## **CHRONIC OTITIS MEDIA ACTIVE MUCOSAL TYPE:**

This is called a permanent perforation of the tympanic membrane with inflammatory changes in the middle ear mucosa and mastoid, and is characterised by mucopurulent discharge in middle ear, granulation tissue, polypoidal mucosa in middle ear, polyp, cholesterol granuloma and ossicular erosion.

### **Histology:**

Histological studies have shown that as the inflammatory process enters the chronic phase, there is a shift in cellular population from infiltrating leukocytes toward mononuclear cells such as macrophages, lymphocytes and plasma cells. In chronic inflammation, the mucosa undergoes metaplasia from a single layer

of ciliated cuboidal or columnar epithelium to mucosa resembling that of the respiratory tract with increasing numbers of goblet cells and glandular cells. Consequently, there is an increase in the volume and viscosity of the mucus. Submucosal changes are fibrosis, hypervascularity, infiltration of lymphocytes, plasma cells and histiocytes. Granulation tissue consisting of vascular connective tissue with inflammatory infiltrates has been found to be the prominent pathologic feature of the chronic otitis media. As the granulation tissue matures, it becomes dense and fibrotic with decreased vascularity. This process leads to scarring and adhesions associated with the ossicular chain and tympanic membrane. As the inflammation persists, sclerosis along with new bone formation can cause a reduction in mastoid and antral pneumatisation. Bony erosion is an important characteristic of the active mucosal and active squamous chronic otitis media. Resorptive osteitis occurs due to hyperaemia with proliferation of capillaries and permanent histiocytes. The following structures are eroded in the following frequency order– incus long process, the crura of the stapes, the body of the incus and the manubrium of the malleus. These structures are involved because of the fine structure and location than the tenacious supply of blood.

**Clinical features:**

Two important presenting symptoms are otorrhoea and hard of hearing. Pain is unusual with chronic otitis media and indicates either a reactive external otitis or the possibility of a developing intratemporal or intracranial complication. The nature of the otorrhoea is helpful in describing the specific type of chronic otitis media. Profuse, intermittent, non foul smelling, mucoid drainage is commonly noted in chronic otitis media mucosal disease. Blood stained drainage is noted with polyps and granulation tissue. The degree of hearing loss will depend on the size and the location of the tympanic membrane perforation and the status of the middle ear. Large perforations will generally cause greater hearing loss compared with smaller defects. In addition, perforations overlying the posterior part of the mesotympanum and thus the round window niche usually cause more severe degrees of conductive hearing loss because the tympanic membrane is no longer protecting the sound energy transfer. As a result there is a reduction of the “baffle effect”, leading to a change in the cochlear mechanics. Ossicular chain involvement will also cause conductive hearing loss. Tympanosclerosis also arises due to chronic inflammation. Usually, this is limited to mild changes in the tympanic membrane but may



involve the middle ear also. As a result, stapes footplate or other ossicles may become fixed.

### **Pure tone audiometric evaluation:**

Every initial evaluation for chronic otitis media should include audiometric testing with air and bone, pure tone thresholds. The degree of hearing loss is helpful in determining the severity of the middle ear disease. Perforations of the tympanic membrane can account for 15 to 20 decibels of conductive hearing loss. When perforations are accompanied by ossicular chain damage, the hearing loss can increase to between 30 decibels and 50 decibels. Finally, the ossicular chain discontinuity with an intact tympanic membrane can account for 55 decibels to 65 decibels of conductive hearing loss. Speech discrimination testing is very much useful. Specifically, speech reception thresholds can help determine whether a patient is a candidate for middle ear reconstructive surgery.

### **Epidemiology**

The incidence of chronic otitis media is present in many developing countries because of poor socio economic conditions, poor dietary habits and lack of health education. In India, overall prevalence rate is 46 persons per thousand and 16 persons per

thousand in rural and urban population respectively. It is a single most important cause of hearing impairment in rural population. The larger is the tympanic membrane perforation, most likely is the development of the chronic otitis media.

### **Aetiology**

There are a lot of factors influencing the development of the chronic otitis media.

The chronic otitis media develops in the following instances:

1. Previous acute otitis media episodes.
2. Crowded surroundings.
3. Day care facilities.
4. Large family.
5. Age.
6. Poor socioeconomic status.

Genetic anomalies predisposes to chronic otitis media. Down syndrome, Cleft palate, choanal atresia, Cri du chat syndrome, microcephaly, cleft lip and DiGeorge syndrome are the conditions that adds to the risk of chronic otitis media, by altering the auditory tube anatomy and functions.

**Causative organisms:**

Age and socio economic conditions is an important deciding factor. *Streptococcus pneumoniae* type III, *Pseudomonas aeruginosa*, Methicillin resistant *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Proteus* species are common bacteriae found.

Anaerobes and fungi may grow simultaneously. Depending upon the microbiology of this disease, the surgeon creates a treatment plan for the patient. *Pseudomonas aeruginosa* is recovered commonly from the chronic discharging ear and pili attaches to diseased and necrotic middle ear epithelium. After getting attached, the bacteriae produce lipopolysaccharide, proteases and enzymes to avoid the normal immunologic defense mechanisms for defending the infection. The resulting injury from inflammatory enzymes causes further necrosis and damage, ultimately causing bone erosion which leads to the chronic otitis media complications. In the immunocompetent individual, the infection seldom produces serious complications and disseminated disease. *Pseudomonas* infections usually is resistant to macrolides, penicillins, and first generation cephalosporin and rarely second generation cephalosporins. *Staphylococcus aureus* is the second

common bacteria isolated from the chronic middle ear disease. The rest of the infection result due a large variety of gram-negative organisms. Klebsiella (10-20%) and Proteus (10-15%) organisms are more common than other gram-negative organisms.

The diagnosis of chronic otitis media needs a perforated tympanic membrane. These perforations may be caused due to trauma, because of tube placement, or due to an acute otitis media episode.

The cause of infection of the middle ear cleft is due to the translocation of organisms from the external ear canal by a hole in the tympanic membrane. Most of the authors suggest that the causative bacteriae may permeate through the auditory tube. This data which supports this theory is not conclusive. Almost all of the pathogenic organisms are commonly seen in the external ear canal.

## **Treatment**

The aim of the treatment is to eliminate the infection and make the ear dry. Aural toileting is done by mopping with absorbent cotton buds and suction clearance.

**Ear drops:**

American Academy of Otolaryngology-Head and Neck Surgery has provided rules for institution of antibiotics in chronic otitis media. The panel decided to use the topical antibiotics alone as first line treatment for the patients. If systemic infection is there, peroral or im or iv antibiotics are used. Studies suggests a mild risk of cochlear and retrocochlear hearing loss in human beings from very small duration of topical aminoglycosides instillation and the vestibular toxicity risk is higher. The emergence of fluoroquinolones, as an otic preparation have no evidence of ototoxicity and says an alternative treatment in most areas. Otic and iv and im antibiotics are used in the treatment of chronic otitis media.

Fluoroquinolone ear drops, with corticosteroid, are the best options for local treatment. These group of antibiotics have an activity with a broad spectrum.

Tobramycin is an ototopical aminoglycoside that may be combined with a corticosteroid.

Piperacillin destroys the biosynthesis of cell wall mucopeptides and the stage of active cell division; additionally, piperacillin shows antipseudomonas activity. Medical treatment usually requires 14 to 21 days.

### **CHRONIC OTITIS MEDIA, MUCOSAL INACTIVE TYPE:**

This is defined as a permanent perforation of pars tensa without inflammatory changes in the middle ear mucosa and mastoid. Clinical features are only hearing loss without active ear discharge. On otoscopic examination, central perforation with pale normal middle ear mucosa is seen.

### **CHRONIC OTITIS MEDIA, INACTIVE SQUAMOUS TYPE:**

Retraction of tympanic membrane as invagination of tympanic membrane into the middle ear cavity. These retraction pocket have the tendency to become active chronic otitis media with retained epithelial debris. Retraction can occur in pars tensa or pars flaccida. Retraction of the pars tensa is classified by Sade et al into 5 grades:

- Grade 1-Pars tensa retracted and in contact with the long process of incus.
- Grade 2-Pars tensa adherent to the long process of incus.
- Grade 3-Pars tensa touching the promontory.
- Grade 4-Pars tensa plastered onto the promontory.

- Grade 5-Pars tensa plastered onto the promontory with a central perforation.

Attic retraction is classified by Tos et al into 4 grades:

- Grade 1-Pars flaccida retracted and in contact with the neck of the malleus.
- Grade 2-Pars flaccida adherent to the neck of the malleus.
- Grade 3-Limited outer attic wall (scutum) erosion.
- Grade 4-Severe outer attic wall (scutum) erosion.

The most important thing is to visualize the retraction pocket completely. The hidden portion may contain non self cleansing accumulation of keratin debris and may eventually become cholesteatoma.

### **CHRONIC OTITIS MEDIA, SQUAMOUS ACTIVE TYPE:**

This is characterized by retraction of attic or posterosuperior pars tensa with retained epithelial debris with inflamed middle ear mucosa. Retention of keratin debris is a characteristic hallmark of cholesteatoma. It has the property of bony erosion by mechanism of immune mediated release of IL 1, IL 6, TNF  $\alpha$  and activation of

osteoclasts. The risk factors for cholesteatoma formation are poor Eustachian tube function and reduced middle ear cleft volume. Squamous epithelial disease is more commonly seen in sclerosed mastoid. Healing is with the formation of auto atticotomy or auto mastoidectomy. Active disease involves bony erosion especially ossicles most commonly the long process of incus, superstructure of stapes, the head of the malleus, bony wall of mastoid leading to abscess formation, facial nerve paralysis, labyrinthine erosion and further erosion of tegmen leading to intracranial complications such as meningitis, extradural abscess, subdural abscess, cerebral abscess and otitic hydrocephalus. The otoscopic findings may show attic cholesteatoma, attic polyp, attic perforation with erosion of scutum, attic wax or crust. Fistula test is positive in cases of labyrinthine fistulae.

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## **INTRODUCTION TO MYRINGOPLASTY**

Myringoplasty is a procedure to close the defect in the tympanic membrane. The principal aim of a myringoplasty operation is to restore functional hearing and to form a non perforated tympanic membrane. Retraction or perforation after reconstruction of the eardrum is a wellknown problem in middle ear surgery as the temporalis fascia can change its shape because of uneven shrinking and thickening, even on the fifth post operative day following grafting. The instability of the temporalis fascia is critical in cases where perforations of the tympanic membrane are large and with retraction and Eustachian tube dysfunction. The use of cartilage in the middle ear has been suggested for use on a limited basis to manage retraction pockets for many years. The array of different techniques developed, such as the perichondrial cartilage island technique, the palisade cartilage technique, the shield technique, the butterfly technique, and the crown cork technique, indicate the variety of methods used to surgically prepare the cartilage. It has been shown that large pieces of cartilage may twist after some years, so small palisades of cartilage are used. The palisade cartilage technique was first described by

Heermann in 1962. The palisade technique has become popular in Europe, especially in Germany, and was proposed as the method of choice for recurrent defects of the tympanic membrane. Cartilage is very useful for managing Eustachian tube dysfunction that may cause graft failures and retractions. Autologous cartilage obtained from the ear (tragus or cyma concha) may resist the negative middle ear pressure because of its rigidity and convexity. So this method, because of the rigidity and stability of the cartilage, may be a better choice than using temporalis fascia in resisting the anatomic deformations caused by infection. It has been shown that cartilage is well tolerated by the middle ear, and long term survival is the dictum. Fascia and perichondrium need a new vascular supply but cartilage is supplied by diffusion. Cartilage also seems to offer high resistance both to lack of vascularization and to infections. The palisade cartilage technique is also resistant to the extreme barometric changes that occur during diving. It has also been shown that a palisade cartilage myringoplasty provides restoration of the same level of auditory function as a myringoplasty using temporalis fascia. To date, many authors have applied composite grafts of perichondrium cartilage and found no impairment of sound conduction in the ear. The aim of this article

was to compare the graft acceptance rates and auditory outcomes of cartilage myringoplasty operations using the palisade technique with those of primary myringoplasty using temporalis fascia in two groups of patients. Success rate is lower in anterior (67%) perforation than posterior location (90%). Presence of middle ear mucosal and contralateral disease is also significant predictors for outcome. A finding of ear discharge at surgery is a poor prognostic factor for myringoplasty. Smoking is associated with worse middle ear status and delayed graft failure according to Becvaroski's study in 2001. Despite concerns about operating on young children who are prone to otitis media, Albera's study shows that tympanic membrane closure and re-perforation rates are similar among patients aged less than 18years, 18-50years, and greater than 50 years.

## **STATISTICS:**

The collected data was analysed with SPSS 16.0 version. To describe about the data descriptive statistics mean, S.D were used. To find the significance difference between the Independent samples (Cartilage & Fascia ) Independent t-test was used & for the Paried samples (Pre-OP & Post-OP) Paried t-test was used and for categorical variable ( Reperforation response ) Chi-square test was used. In all both the above statistical tools the probability value  $P = .05$  is considered as significant level.

## T-Test

	Highly Sig. Diff at $P < .01$ level
	No Sig. diff at $P < .05$ level
	Corresponding Chi-Square value
	Corresponding t-value

## T-Test

**GROUPS = CARTILAGE**

### Paired Samples Statisticsa

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PREOP	47.47	30	4.946	.903
	POSTOP	29.80	30	5.346	.976

### Paired Samples Testa

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PREOP - POSTOP	17.667	6.305	1.151	15.313	20.021	15.348	29	.000

**GROUPS = CARTILAGE**

**Descriptive Statistics<sup>a</sup>**

	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
AGE	30	34.63	12.274
PREOP	30	47.47	4.946
POSTOP	30	29.80	5.346
PREPOSTDIFF	30	17.67	6.305
Valid N (listwise)	30		



**GROUPS = FASCIA**

**Paired Samples Statisticsa**

		<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Pair 1	PREOP	48.33	30	4.663	.851
	POSTOP	32.10	30	9.106	1.663

Paired Samples Testa

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PREOP - POSTOP	16.233	8.721	1.592	12.977	19.490	10.196	29	.000

## Descriptives

**GROUPS = CARTILAGE**

**Descriptive Statistics<sup>a</sup>**

	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
AGE	30	34.63	12.274
PREOP	30	47.47	4.946
POSTOP	30	29.80	5.346
PREPOSTDIFF	30	17.67	6.305
Valid N (listwise)	30		

**GROUPS = FASCIA**

**Descriptive Statisticsa**

	N	Mean	Std. Deviation
AGE	30	35.90	10.571
PREOP	30	48.33	4.663
POSTOP	30	32.10	9.106
PREPOSTDIFF	30	16.23	8.721
Valid N (listwise)	30		

## Frequencies

**GROUPS = CARTILAGE**

**SEXa**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	17	56.7	56.7	56.7
	M	13	43.3	43.3	100.0
	Total	30	100.0	100.0	

**GROUPS = FASCIA**

**SEXa**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	10	33.3	33.3	33.3
	M	20	66.7	66.7	100.0
	Total	30	100.0	100.0	

## Crosstabs

### REPERFORATION \* GROUPS Crosstabulation

			GROUPS		Total
			CARTILAG E	FASCI A	
REPERFORATION	NO	Count	28	24	52
		% within GROUPS	93.00	80.00	87.00
	YES	Count	2	6	8
		% within GROUPS	7.00	20.00	13.00
Total		Count	30	30	60
		% within GROUPS	1.0	1.0	1.0

### Chi-Square Tests

	Value	df	Asymp. Sig. (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.308	1	.129	.254	.127
Continuity Correction <sup>b</sup>	1.298	1	.255		
Likelihood Ratio	2.401	1	.121		
Fisher's Exact Test					
Linear-by-Linear Association	2.269	1	.132		
N of Valid Cases	60				



## **MATERIALS AND METHODS**

### **Material:**

- Study design - Prospective study
- Study place - Department of ENT Stanley Medical College, Chennai – 600 001
- Study period - March 2013 to September 2013.
- Sample size - 60 patients divided randomly into 2 groups.
- Follow up for 6 months.

### **Inclusion criteria:**

- Age - 20 years to 60 years.
- Duration of symptoms - 2 years.
- Retraction with central perforation.
- No foci of sepsis in the nose, paranasal sinus or nasopharynx.
- No history of previous otological surgery in the particular ear of interest.
- Conductive hearing loss of not more than 55 decibels.
- Good cochlear function.

**Exclusion criteria:**

- Age less than 20 years and more than 60 years.
- Atelectasis of tympanic membrane and cholesteatoma.
- Any foci of sepsis in nose, paranasal sinus nasopharynx. Previous otological surgery in the particular ear of interest.
- Conductive hearing loss of more than 55 decibel.
- Presence of sensorineural hearing loss.
- Patient with posterosuperior retraction or cholesteatoma.

**Methodology:****Myringoplasty: Steps:**

- Harvesting of temporalis fascia.
- Freshening of margin of perforation.
- Canal incision and elevation of tympanomeatal flap.
- Assessment of integrity of ossicular chain.
- Graft placement.

**Harvesting of temporalis fascia:**

Temporalis fascia is a time tested material with an excellent take up rate because of its low metabolic rate. The fascia is elevated from the underlying temporalis muscle by injecting saline underneath the fascia to facilitate easy removal. Temporalis fascia is harvested under direct vision by sharp dissection.

**Freshening of margins of perforation:**

The margins of perforation are freshened by using sickle knife and the rim is removed by using cup forceps.

**Elevation of tympanomeatal flap:**

An U-shaped incision is made in the bony canal skin. The superior incision is started at 12 O' clock position and inferior incision started at 6 O' clock position. The tympanomeatal flap is elevated up to the fibrous annulus. The middle ear is entered using sickle knife. The handle of malleus is skeletonised.

**Assessment of integrity of ossicular chain:**

Each of the ossicles has to be assessed for mobility.

**Underlay temporalis fascia grafting:**

Temporalis fascia is placed under the remnant of tympanic membrane with fibrous annulus and under the handle of malleus.

Underlay technique of grafting has replaced the overlay technique due to higher chance of lateralization of graft, anterior blunting, longer healing time and formation of epithelial pearl associated with overlay technique. After grafting, the tympanomeatal flap is repositioned. Gel foam is kept around the flap and graft.

The study population included 60 patients who were not selected according to age or sex. In all patients, an unilateral retraction with central perforation with Eustachian tube dysfunction was detected. A total

of 30 patients underwent a myringoplasty using temporalis fascia, while in the other 30 patients, palisade cartilage was used as a graft material to close the tympanic membrane retraction with perforation. The indication for surgery was the presence of a unilateral retraction with perforation and mild to moderate Eustachian tube dysfunction, an intact ossicular chain, at least an one month dry period and normal middle ear mucosa. Patients who had history of previous ear surgery were excluded from this study. In the patients who underwent palisade cartilage myringoplasty, conchal cartilage was used in all cases. The perichondrium was removed from one side of the cartilage, and the cartilage was then cut into several slices with, on average, four or five palisades two placed anterior to the malleus handle and two or three placed posteriorly. The remaining perichondrium was left attached to the cartilage slices on the lateral side. The perichondrium layer removed at the beginning of the procedure was then laid on the cartilage palisades, so that all the small openings between the slices were covered to improve the healing process. In the patients who underwent myringoplasty where the temporalis muscle fascia was used as a grafting material, the graft was harvested from the ipsilateral deep temporal muscle fascia and placed lateral to the long process of the malleus, and medial to the drum remnant and tympanic annulus. Gelfoam was placed both medial and lateral to the graft, and the wound was closed using absorbable suture.

## Audiometer and Otoscope



Harvesting of conchal cartilage

**Post operative follow up:**

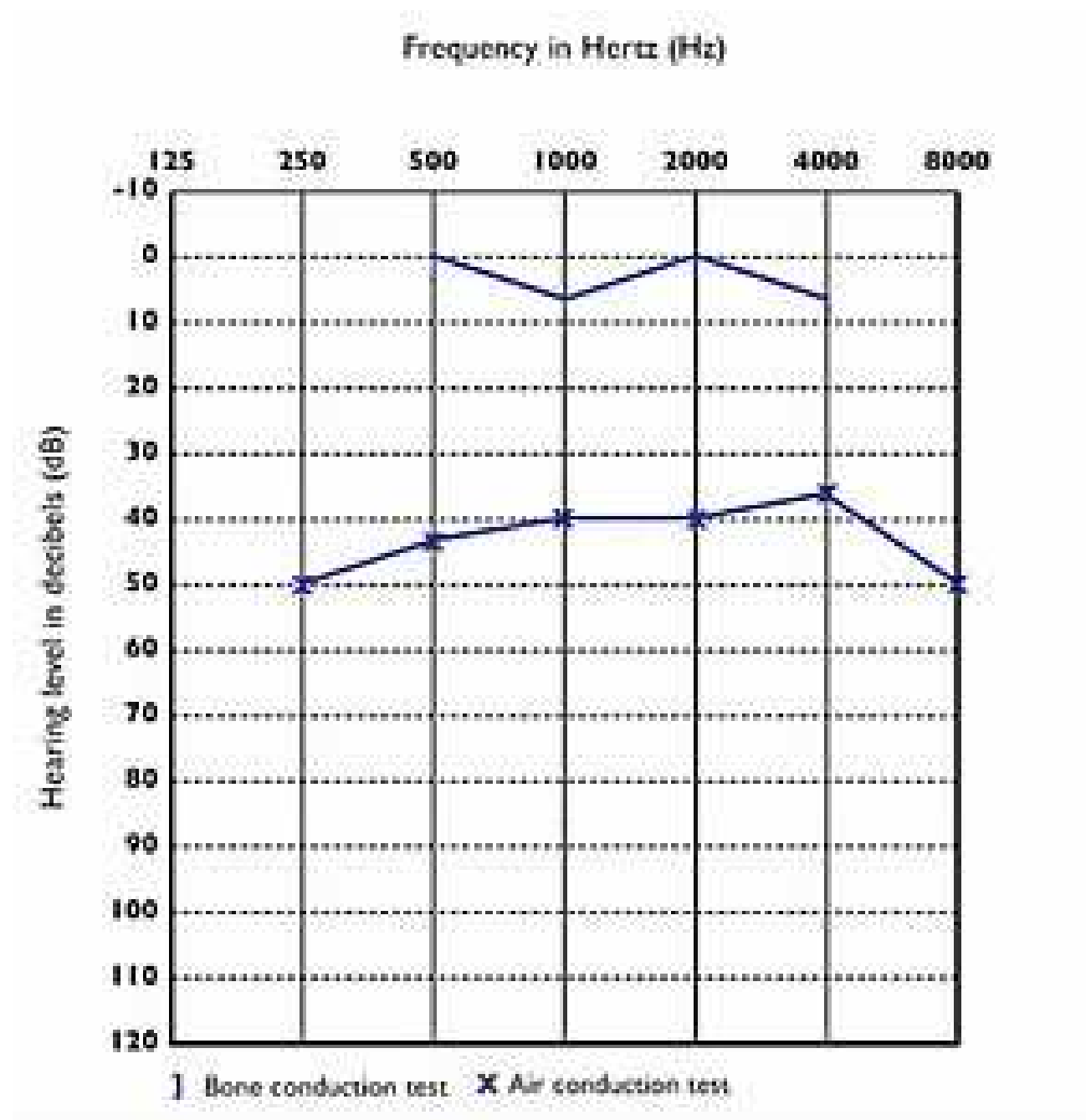
Postoperatively, the patients were evaluated in a regular clinical manner and audiometrically at a six month follow up period. A successful myringoplasty was defined as successful acceptance of the graft, and intact healing of the tympanic membrane without perforation, retraction, or lateralization within a follow up period of six months from the operation. Auditory outcomes were evaluated using pure tone audiograms. Audiological data were gathered from the preoperative and postoperative audiograms of the patients. The patients' data were reviewed for changes in the pre operative and post operative air–bone gaps, which was defined as the difference between the pre operative and post operative air–bone gap; pure tone averages at 500 Hz, 1000 Hz and 2000 Hz. Data analyses were performed using the chi-square test and Student's t-test for independent samples and paired samples were used for statistical comparisons. A *P* value of less than 0.05 was considered statistically significant.

## **RESULTS**

The patients' ages ranged from 20 years to 60 years with a mean of 40 years; 27 patients (45%) were female and 33 patients (55%) were male. In the patients who underwent palisade cartilage myringoplasty, 17 patients (56.7%) were female and 13 patients (43.3%) were male, and in the group who underwent temporalis fascia myringoplasty, 10 patients (33.3%) were female and 20 patients (66.7%) were male. In all patients, a pure tone audiogram from 250 Hz to 8 KHz was obtained preoperatively. The follow up period was six months post operatively. Graft acceptance was achieved in 28 patients(93%) who underwent palisade cartilage myringoplasty, whereas it was achieved in 24 patients (80%) in the temporalis fascia myringoplasty group. This difference was not statistically significant according to the chi-square test ( $P= 0.127$ ). Two graft failures were observed in the patients who underwent palisade cartilage myringoplasty, but six graft failures were observed in the temporalis fascia myringoplasty group in the form of reperforation and retraction. In both graft failures, a small perforation developed at the central part of the tympanic membrane. There were no significant complications such as graft lateralization, blunting, or infection. In each group, the postoperative results were satisfactory. Also, a comparison of the mean air bone gap changes between the two groups was not statistically significant either ( $P>0.05$ ). Overall, a comparison of all the

audiologic results between the two groups did not reveal any statistically significant differences.

**Preoperative audiogram of a patient who where to undergo temporalis fascia myringoplasty:**

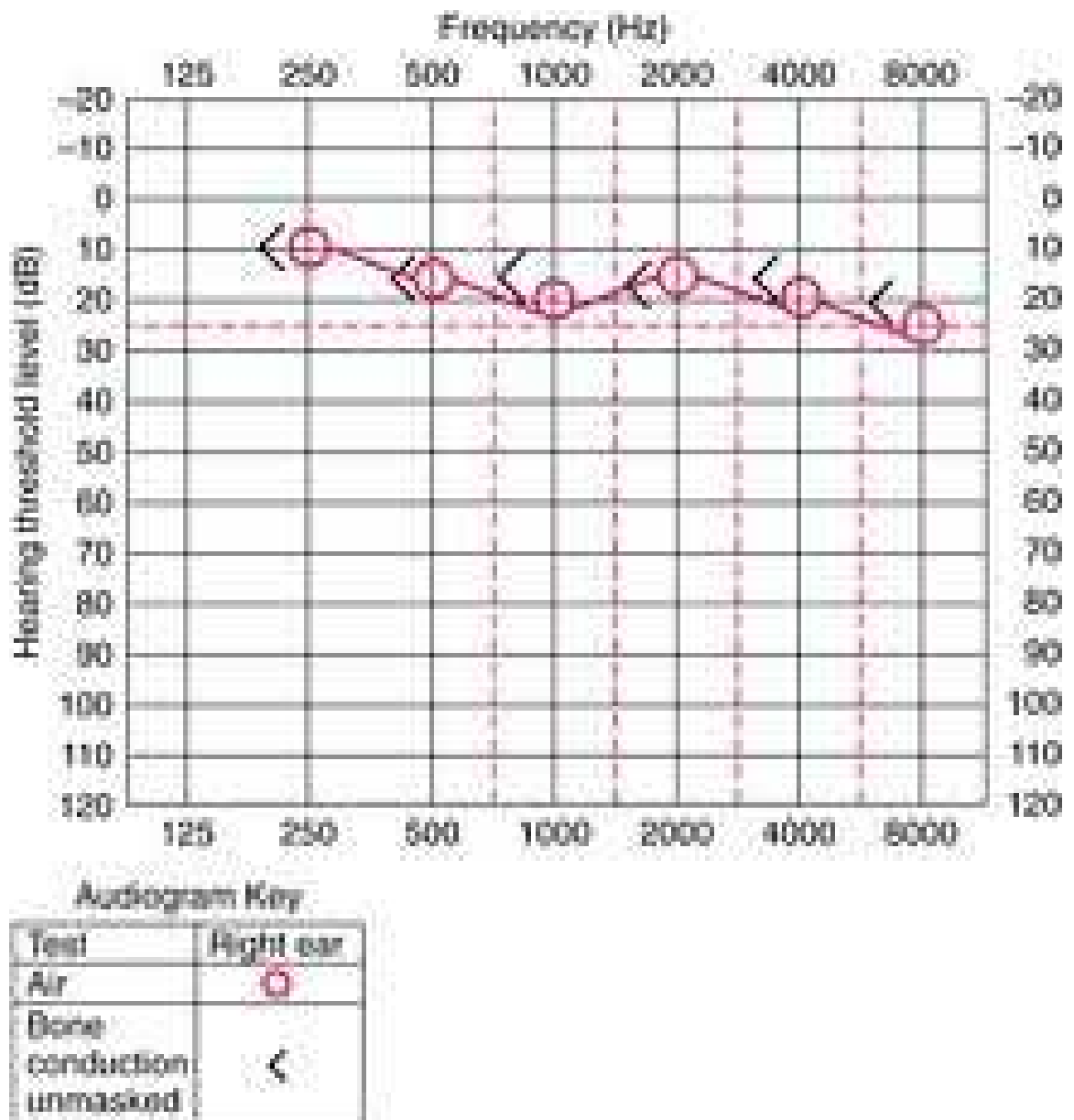




### **POSTOPERATIVE CARE:**

Topical antibiotic drop is initiated for 2 weeks after surgery. 2 weeks after the surgery, all gelfoam in the external auditory canal is removed. Avoidance of head bath and entry of water into the ear is advised for 6 weeks. Audiogram is obtained at 3<sup>rd</sup> month of the postoperative period, mainly to evaluate air bone gap, since tympanometry is no longer reliable given the rigidity of the cartilage graft. If the entire tympanic membrane is reconstructed with cartilage, surveillance by otoscopy might be difficult due to its opaque appearance. Air bone gap is a good tool to assess the presence of the middle ear effusions.

Postoperative audiogram of a patient at 3<sup>rd</sup> month:



At 3<sup>rd</sup> month and 6<sup>th</sup> month, the patients are followed up with regard to the following variables like hearing improvement, reperforation, ear discharge and retraction of tympanic membrane.

## **DISCUSSION**

The use of cartilage is experiencing a renaissance in ear surgery because it appears to offer extremely reliable method for reconstruction of the tympanic membrane in cases of advanced middle ear pathology and Eustachian tube dysfunction. In this short term study, patients with retraction with perforations, an intact ossicular chain, at least an one month dry period, and normal middle ear mucosa were included. The graft acceptance rate was 93% for the patients who underwent a palisade cartilage myringoplasty and 80% for the patients who underwent temporalis fascia myringoplasty; this difference was not statistically significant. Our results were comparable to other studies. For example, Neumann and colleagues reviewed 84 cases of patients who underwent palisade technique, with mixed pathologies such as retraction with perforation, adhesive processes and chronic mesotympanal otitis, and found an overall graft acceptance rate of 97.6%. No perforations were found in patients following palisade cartilage myringoplasty, whereas there were four perforations in the patients who underwent temporalis fascia myringoplasty. In our study, auditory function in palisade cartilage myringoplasty patients was not statistically different when compared to the gains observed in the patients who underwent temporalis fascia myringoplasty. Other studies in the literature have also reported good or acceptable hearing results with cartilage grafting. Cagdas Kazikdas and

colleagues demonstrated that a comparison of the gains in mean speech reception threshold, air–bone gap, and pure-tone average scores between the palisade cartilage myringoplasty and temporalis fascia technique showed no significant differences. Following cartilage perichondrial composite graft myringoplasty, Levinson reported that 65% of his patients had closure of the air bone gap to within 10 decibel and 86% to within 20 decibel. In a study by Dornhoff, no significant differences were demonstrated in gains in auditory function in patients who had cartilage perichondrium grafting compared with patients who had grafts of perichondrium alone. Kirazli and colleagues also found no significant difference between the audiologic results after cartilage perichondrium and temporalis fascia myringoplasty. Similarly, a study by Cabra and colleagues observed no relevant differences between the functional results of the two procedures (palisade cartilage myringoplasty and temporalis fascia myringoplasty). The ideal acoustic thickness of cartilage should be approximately 0.5 mm. The full thickness is 0.7 to 1 mm. However, thinning the cartilage makes the reconstruction process more difficult due to the inevitable twisting of the cartilage. We applied full thickness cartilage in our procedure. Experimental histopathologic studies have shown that cartilage is stable because of the fibrile structure of the matrix, which is independent of the survival of cellular elements. Reconstruction of the tympanic membrane using the palisade cartilage

technique in myringoplasties allowed us to achieve good anatomic and audiologic results that were at least similar, if not better than traditional methods of reconstruction in high-risk cases.

## **CONCLUSION**

The results of this study are in favour of using the palisade cartilage technique in difficult cases like retraction with central perforation. The outcomes in our patient series indicate that palisade cartilage myringoplasty achieves good results in retraction with central perforation cases. Cartilage, a very effective material for the reconstruction of the tympanic membrane and grafts can provide an excellent anatomical result, perfect stability and good functional outcomes. Cartilage myringoplasty offers otologists a reliable armamentarium in tympanic membrane reconstruction. The choice of techniques depends on surgeon's preference, the integrity of the ossicular chain, the size of the perforation and the presence of cholesteatoma. Despite its rigid quality, cartilage myringoplasty achieves good audiologic results comparable to temporalis fascia graft.

## **REFERENCES**

1. Committee on Conservation of Hearing, American Academy of Ophthalmology and Otolaryngology: Standard classification for surgery of chronic ear disease. Arch Otol 1965; 81: 204.
2. Storrs LA. Myringoplasty with the use of fascia grafts. Arch.Otolaryngol 1961; 74: 65.
3. Indorewala S. Dimensional stability of the free fascia grafts: An animal experiment. Laryngoscope2002; 112(4): 727-30.
4. Indorewala S, Pagare R, Aboojiwala S, Barpande S. Dimensional stability of the free fascia grafts:A human study. Laryngoscope 2004; 114(3): 543-7.
5. Sheehy JL. Surgery of chronic otitis media. English otolaryngology. Philadelphia: Harperand Row;1985: 1-86.
6. Tos M. Cartilage tympanoplasty, classification of methods technique results. Otology J2009; 1: 7.
7. Cagdas Kazikdas K, Onal K, Boyraz I. Palisade cartilage tympanoplasty for management of perforations: A comparison with the temporalis fascia technique. Eur Arch Otol 2007; 264: 985-9.

8. Neumann A, Schultz-Coulon H, Jahnke K. Type III tympanoplasty applying the palisade cartilage technique: A study of 61 cases. *Otol Neurotol* 2003; 24: 33-7.
9. Velepici M, Bonifacic M, Manestar D. Cartilage palisade tympanoplasty and diving. *Otol Neurotol* 2001; 22: 430-2.
10. Andersen J, Cayé-Thomasen P, Tos M. A comparison of fascia and cartilage palisades in tympanoplasty after surgery for sinus and tensa retraction cholesteatoma in children. *Otol Neurotol* 2004; 25: 856-63.
11. Neumann A, Hennig A, Schultz-Coulon HJ. [Morphological and functional results of palisade cartilage tympanoplasty]. *HNO* 2002; 50(10): 935-9. (German).
12. Uzun C, Caye-Thomasen P, Andersen J, Tos M. A tympanometric comparison of tympanoplasty with cartilage palisades or fascia after surgery for tensa cholesteatoma in children. *Laryngoscope* 2003; 113(10): 1751-7.
13. Levinson RM. Cartilage-perichondrial composite graft tympanoplasty in the treatment of posterior marginal and attic retraction pockets. *Laryngoscope* 1987; 97: 1069-74.



14. Dornhoffer JL. Hearing results with cartilage tympanoplasty. *Laryngoscope* 1997; 107: 1094-9.
15. Kirazli T, Bilgen C, Midilli R, Ogut F. Hearing results after primary cartilage tympanoplasty with island technique. *Otolaryngol Head Neck Surg* 2005; 132: 933-7.
16. Cabra J, Monux A. Efficacy of cartilage palisade tympanoplasty: Randomized controlled trial. *Otol Neurotol* 2010; 31: 589-95.
17. Zahnert T, Huttenbrink KB, Murbe D, Bornitz M. Experimental investigations of the use of cartilage in tympanic membrane reconstruction. *Am J Otol* 2000; 21: 322-8.
18. Ozbek C, Ciftci O, Tuna E, Yazkan O. A comparison of cartilage palisades and fascia in type 1 tympanoplasty in children: Anatomic and functional results. *Otol Neurotol* 2008; 29: 679-83.
19. Hamed M, Samir M, El Bigermy M. Fate of cartilage material used in middle ear surgery light and electron microscopy study. *Auris Nasus Larynx* 1999; 26: 257-62.

20. Rudderman RH, Guvoron B, Mendelsohn G. The fate of fresh and preserve crus autogenous cartilage in rabbit model. *Ann Plast Surg* 1994; 32: 250-4.
21. Vikram BK, Khaja N, Udayashankar SG, Venkatesha BK, Manjunath D. Clinico epidemiological study of complicated and uncomplicated chronic suppurative otitis media. *J Laryngol Otol*. May 2008;122(5):442-6.
22. Gregg JB, Steele JP, Holzhuetter A. Roentgenographic evaluation of temporal bones from South Dakota Indian burials. *American Journal of Physical Anthropology*. 1965;23:51-62.
23. Rathbun TA, Mallin R. Middle ear disease in a prehistoric Iranian population. *Bull N Y Acad Med*. Dec 1977;53(10):901-5.
24. Kenna MA. Microbiology of Chronic Suppurative Otitis Media. *Ann Otol Rhinol Laryngol*. 1988;97(suppl 131):9-10.
25. Kenna MA. Etiology and Pathogenesis of Chronic Suppurative Otitis Media. *Ann Otol Rhinol Laryngol*. 1988;97(Suppl 131):16-17.

26. Matsuda Y, Kurita T, Ueda Y, Ito S, Nakashima T. Effect of tympanic membrane perforation on middle-ear sound transmission. *J Laryngol Otol.* May 2009;123 Suppl :81-9.
27. Wright D, Safranek S. Treatment of otitis media with perforated tympanic membrane. *Am Fam Physician.* Apr 15 2009;79(8):650, 654.
28. van der Veen EL, Schilder AG, van Heerbeek N, et al. Predictors of chronic suppurative otitis media in children. *Arch Otolaryngol Head Neck Surg.* Oct 2006;132(10):1115-8.
29. Vikram BK, Khaja N, Udayashankar SG, Venkatesha BK, Manjunath D. Clinico epidemiological study of complicated and uncomplicated chronic suppurative otitis media. *J Laryngol Otol.* May 2008;122(5):442-6.
30. Smith JA, Danner CJ. Complications of chronic otitis media and cholesteatoma. *Otolaryngol Clin North Am.* Dec 2006;39(6):123
31. Neilan RE, Isaacson B, Kutz JW Jr, Lee KH, Roland PS. Pediatric otogenic lateral sinus thrombosis recanalization. *Int J Pediatr Otorhinolaryngol.* Jun 2011;75(6):850-3.

32. Isaacson B, Mirabal C, Kutz JW Jr, Lee KH, Roland PS. Pediatric Otogenic intracranial abscesses. *Otolaryngol Head Neck Surg.* Mar 2010;142(3):434-7.
33. Dohar JE. Old and New Otological Agents for the Acute and Chronic Draining Ear. *Seminars in Otitis Media Management.* 1. 1998;1-14.
34. Dohar JE, Kenna MA, Wadowsky RM. Therapeutic implications in the treatment of aural *Pseudomonas* infections based on in vitro susceptibility patterns. *Arch Otolaryngol Head Neck Surg.* Sep 1995;121(9):1022-5.
35. Roland PS, Dohar JE, Lanier BJ, Hekkenburg R, Lane EM, Conroy PJ. Topical ciprofloxacin/dexamethasone otic suspension is superior to ofloxacin otic solution in the treatment of granulation tissue in children with acute otitis media with otorrhea through tympanostomy tubes. *Otolaryngol Head Neck Surg.* Jun 2004;130(6):736- 41.
36. Consensus Panel, Hannley MT, Dennenny III JC. Use of Otological Antibiotics in Treating 3 Common Ear Diseases. *Otol Head Neck Surg.* 2000;934-40.

37. Somekh E, Cordova Z. Ceftazidime versus aztreonam in the treatment of pseudomonal chronic suppurative otitis media in children. *Scand J Infect Dis.* 2000;32(2):197-9.
38. Anisur Rahman. Healing of tympanic membrane perforation : an experimental study by. From Karolinska Institute And University Hospital Stockhole Sweden 2007, ISBN 978-91-7357-243-9.
39. Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology. Standard classification for surgery of chronic ear infection. *Arch Otolaryngol Head Neck Surg* 1964;81:204-5.
40. Goodhill V. Articulated polyethylene prosthesis with perichondrial Graft in stapedectomy. *Rev Laryngol(Bordeaux)* 1951;82:305\_320.
41. Linde RE. The cartilage-perichondrium graft in the treatment of posterior tympanic membrane retraction pockets. *Laryngoscope* 1973;83:747–53
42. Tabb HG. Closure of perforations of the tympanicmembrane by vein grafts: a preliminary report of 20cases. *Laryngoscope* 1960;70:271\_286

43. Storrs L. Myringoplasty with the use of Fascia Grafts. Arch Otolaryngol 1961;74:45\_49.
44. Yetiser S, Tosun F, Satar B. Revision myringoplasty with solvent- dehydrated human dura mater: Otolaryngol Head Neck Surg. 2001 May;124(5):518-21.
45. Heermann J, Heermann H, Kopstein E. Fascia and cartilage palisade tympanoplasty. Arch Otolaryngol 1970;91:228–41.
46. Couloigner V, Baculard F, El Bakkouri W, Viala P, Francois M, Narcy P et al. Inlay butterfly cartilage tympanoplasty in children. Otol Neurotol 2005;26:247 –51.
47. Gerber MJ, Mason JC, Lambert PR. Hearing results after primary cartilage tympanoplasty. Laryngoscope 2000;110: 1994–9.
48. Adkins WY. Composite autograft for tympanoplasty and tympanomastoid surgery. Laryngoscope 1990;100:244–7.
49. Anderson J, Caye-Thomasen P, Tos M. A comparison of cartilage palisades and fascia in tympanoplasty after surgery for sinus or tensa retraction cholesteatoma in children. Otol Neurotol 2004;25:856–63.

50. Gierek T, Slaska-Kaspera A, Majzel K, Klimczak-Gotqbm L. Results of myringoplasty and type I tympanoplasty with the use of fascia, cartilage and perichondrium grafts [in Polish]. *Otolaryngologia Polska* 2004;3:529–33.
51. M YUNG Cartilage tympanoplasty: literature review. *The Journal of Laryngology & Otology* (2008), 122, 663–672. # 2008 JLO (1984) Limiteddoi:10.1017/S0022215108001813.
52. Ayache D, Zaki Z, Wiener V. Williams MT. Delayed luxation of the stapes into the vestibule after cartilage tympanoplasty. *Otol Neurotol* 2006;27:901-2.
53. Ghanem MA, Monroy A, Alizadeh FS, Nicolau Y, Eavey RD. Butterfly cartilage graft inlay tympanoplasty for large perforations. *Laryngoscope* 2006;116:1813–16.
54. Banzer, M. (1640) *Disputatio de auditione laesa* (Dissertation on deafness).
55. Yearsley J. *Deafness practically illustrated*. London: Churchill & Sons; 1863.

56. Toynbee J. On the use of an artificial membrana tympani in cases of deafness dependent upon perforations or destruction of the natural organ. London: J. Churchill & Sons; 1853.
57. Roosa DB. Diseases of the ear. New York: William Wood & Co.; 1876.
58. Blake CJ. Transactions of the First Congress of the International Otological Society. New York: D. Appleton & Co; 1887.
59. Zollner F. The principles of plastic surgery of the sound-conducting apparatus. J Laryngol Otol 1955;69:637.
60. Joynt JA. Repair of drum. Iowa Med Soc 1919;9:51.
61. Derlacki EL. Repair of central perforations of tympanic membrane. Arch Otolaryngol 1953;58:405.
62. Wullstein H. Funktionelle Operationen im Mittelohr mit Hilfe des freien Spalt-lappen-Transplantates. Arch Ohren-Nasen-u Kehlkopfh 1952;161:422.
63. Zollner F. Panel of myringoplasty. Second workshop on reconstructive middle ear surgery. Arch Otol 1963;78:301.
64. Heermann H. Tympanic membrane plastic with temporal fascia. Hals-Nasen-Ohrenh 1960;9:136.



65. Shea JJ. Vein graft closure of eardrum perforations. *J Laryngol Otol* 1960;74:358.
66. Glasscock ME, House WF, Graham M. Homograft transplants to the middle ear. A follow-up report. *Laryngoscope* 1972;82:868.
67. MacKinnon DM. Homograft tympanic membrane in myringoplasty. *Ann Otol Rhinol Laryngol* 1972;81:194–202.
68. Overbosch HC. Homograft myringoplasty with micro-sliced septal cartilage. *Pract Otorhinolaryngol* 1971;33:356–7.
69. Brandow EC Jr. Homograft tympanic membrane transplant in myringoplasty. *Trans Am Acad Ophthalmol Otolaryngol* 1969;73:825.
70. Packer P, Mackendrick A, Solar M. What's best in myringoplasty: underly or overlay, dura or fascia? *J Laryngol Otol* 1982;96:25–41.
71. Zakzouk S, Attallah M. Transcanal tympanoplasty: dura versus temporalis fascia. *Ear Nose Throat J* 1992;71:590–2.
72. Sunil S Nichlani et al. Reconstruction of the Tympanic Membrane with Partial Tragal cartilage Graft Versus

Temporalis Fascia Graft. Bombay Hospital Journal, vol.52, No.2, 2010.

73. Heermann J. Auricular cartilage palisade tympano-, epitympano-antrum- and mastoid-plasties. Clin Otolaryngol 1978;3:443–6.
74. Milewski C. Composite graft tympanoplasty in the treatment of ears with advanced middle ear pathology. Laryngoscope 1993;103:1352–6.
75. Overbosch HC. Homograft myringoplasty with microsliced septal cartilage. Practica Oto-Rhino-Laryngologica 1971;33:356–7.
76. Hyden D.: Ear drum perforations in children after ventilation tube treatment.: Int J Pediatr Otorhinolaryngol 1994;29:93–100.
77. Murbe D, Zahnert T, Bornitz M, Huttenbrink KB. Acoustic properties of different cartilage reconstruction techniques of the tympanic membrane. Laryngoscope 2002; 112:1769–76.
78. Duckert LG, Muller J, Makielski KH, Helms J. Composite autograft “shield” reconstruction of remnant tympanic membranes. Am J Otol 1995;16:21–6.

79. Dornhoffer JL. Hearing results with cartilage tympanoplasty. *Laryngoscope* 1997;107:1094–99.
80. Spielmann P, Mills R. Surgical management of retraction pockets of the pars tensa with cartilage and perichondrial grafts. *J Laryngol Otol* 2006;120:725–9.
81. Shin S-H, Lee W-S, Kim H-N, Lee H-K. Wheel-shaped cartilage-perichondrium composite graft for the prevention of retraction pocket development. *Acta Otolaryngol (Stockh)* 2007;127:25–8.
82. Eavey RD. Inlay tympanoplasty: cartilage butterfly technique. *Laryngoscope* 1998;108:657–61.
83. Hartwein J, Leuwer RM, Kehrl W. The total reconstruction of the tympanic membrane by the “crown cork” technique. *Am J Otolaryngol* 1992;13:172–5.
84. Neumann A, Jahnke K. Tympanic membrane reconstruction using cartilage – indications, techniques and results [in German]. *HNO* 2005;53:573–8.

85. Dornhoffer J. Cartilage tympanoplasty: indications, techniques, and outcomes in a 1,000-patient series. *Laryngoscope* 2003;113:1844–56.
86. Zahnert T, Huttenbrink K-B, Murbe D, Bornitz M. Experimental investigations of the use of cartilage in tympanic membrane reconstruction. *Am J Otology* 2000;21: 322–8.
87. Mirko Tos.:Cartilage Tympanoplasty: Classifications of methods—techniques--Results :Edition I, Thieme,2009.
88. Dornhoffer JL. Hearing results with cartilage tympanoplasty. *Laryngoscope* 1997;107:1094–99.
89. Gerber MJ, Mason JC, Lambert PR. Hearing results after primary cartilage tympanoplasty. *Laryngoscope* 2000;110:1994–9.
90. Anderson J, Caye-Thomasen P, Tos M. A comparison of cartilage palisades and fascia in tympanoplasty after surgery for sinus or tensa retraction cholesteatoma in children. *Otol Neurotol* 2004;25:856–63.
91. Gierek T, Slaska-Kaspera A, Majzel K, Klimczak-Gotqb L. Results of myringoplasty and type I tympanoplasty with the

use of fascia, cartilage and perichondrium grafts[in Polish].  
Otolaryngologia Polska 2004;3:529–33.

92. Couloigner V, Baculard F, El Bakkouri W, Viala P, Francois M, Narcy P et al. Inlay butterfly cartilage tympanoplasty in children. Otol Neurotol 2005;26:247–51.

## **PROFORMA**

**Case no:**

Name :

Address:

Age :

IP no :

Sex:

Occupation:

**Presenting complaints :**

Side

Duration

Ear Discharge

Hard of Hearing

Ear pain

Tinnitus

Giddiness

**History of presenting illness**

**Ear discharge**      –      Side

Duration

Onset

Type

Quantity

Continuous / Intermittent

Aggravating / Relieving factor

**Hard of hearing**

Side

Duration

Onset

Progression

**Ear Pain**

Side

Duration

**Intensity**

Aggravating/Relieving Factors

**Nasal Complaints**

Nasal Block /Nasal Discharge/Headache

**Throat Complaints**

Throat Pain , Difficulty in swallowing

**Past History**

Any previous of Surgery

Any H/o DM /Hypertension /TB/Asthma/CAD/Epilepsy

Any H/o Drug Allergy/Bleeding Diathesis.

**Family History:**

Any similar illness in the family .

**General Physical Examination:**

Built /Nutrition /Febrile/Anemia/Jaundice/Cyanosis/generalized

lymphadenopathy.

**Systemic Examination – CVS/RS/PA/CNS**

**ENT Examination**

**Examination of the Ear**

**Right**

**Left**

Preauricular Region

Pinna

Postauricular Region

External Auditory Canal

Tympanic Membrane

Middle Ear Status

Tuning Fork tests

Rinnes test

Weber test

Absolute Bone Conduction test

Tragus sign

Fistula test

Three point Mastoid tenderness

Facial Nerve Examination



## **Examination Of Nose**

External Nose

Dorsum

Ala

Columella

Anterior Rhinoscopy	Right	Left
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Septum

Inferior Turbinate

Inferior Meatus

Middle Turbinate

Middle Meatus

Cottles Test

Cold spatula Test

Cotton Wool test

Paranasal Sinus Tenderness

## **Examination of Throat**

Lips /teeth /gums/anterior 2/3<sup>rd</sup> Tongue /Hard Palate /RMT /

Soft palate/Uvula/Tonsil/Anterior and Posterior Pillar /Posterior pharyngeal Wall .

## **Provisional Diagnosis**

### **Investigation**

1. Pure Tone Auditory
2. X –ray Mastoid
3. Diagnostic Nasal Endoscopy
4. CT PNS

### **Management**

Medical Management

Surgical Management

1. Cartilage Myringoplasty
2. Temporalis fascia Myringoplasty.

## **Post operative follow up**

3 months

6 months

Otoscopic Examination

Tuning Fork Test

Pure Tone Audiometry

INSTITUTIONAL ETHICAL COMMITTEE,  
STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Comparative Study between endoscopic cartilage myringoplasty and endoscopic temporalis fascia graft myringoplasty

Principal Investigator : Dr.P.Chozhan

Designation : PG in M.S.(E.N.T)

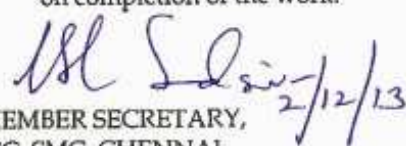
Department : Department of E.N.T  
Government Stanley Medical College,  
Chennai-10

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 07.02.2013 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

  
MEMBER SECRETARY,  
IEC, SMC, CHENNAI

## நோயாளர் தகவல் படிவம்

ஸ்டேன்லி மருத்துவமனையின் காது, மூக்கு, தொண்டை சிகிச்சை பிரிவில் காதில் சீழ் வடியும் நோய்க்காக அறுவை சிகிச்சையும் அது குறித்து ஆராய்ச்சியும் நடைபெற்றதை அறிந்து கொண்டேன். மேலும் அறுவை சிகிச்சை முடிந்த பின்பு ஒரு வருட காலத்திற்கு தொடர்ந்து கண்காணிப்பில் இருக்க வேண்டியதன் அவசியத்தையும் அறிந்து கொண்டு முழு மனதுடன் இந்த ஆராய்ச்சியில் பங்கு கொள்ள சம்மதிக்கிறேன்.

இப்படிக்கு

(நோயாளர் பெயர்)

நாள்:

தேதி:

உள் நோயாளி எண்:

## ஓப்புதல் படிவம்

எனக்கு காது சவ்வில் ஓட்டை விழுந்து சீழ் வந்து கொண்டிருப்பதால் அறுவை சிகிச்சை செய்ய வேண்டியதன் அவசியம் மருத்துவரால் எடுத்துரைக்கப்பட்டது. அறுவை சிகிக்கையின் போது ஏற்படும் பக்கவிளைவுகளையும் மருத்துவர் மூலம் அறிந்து கொண்டேன். அறுவை சிகிச்சையின் போது ஏற்படும் பக்க விளைவுகளுக்கு மருத்துவரோ மருத்துவமனையோ பொறுப்பல்ல என்பதை உணர்ந்து முழு மனதுடன் அறுவை சிகிச்சைக்கு சம்மதிக்கிறேன்.

இப்படிக்கு

(நோயாளர் பெயர்)

இடம்:

தேதி:

உள் நோயாளி எண்:

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The Tamil Nadu Dr. M.G.R. Medic... Medical - DUE 31-Dec-2013

What's New

Originality GradeMark PeerMark

comparative study between endoscopic cartilage vs endoscopic temporalis fascia

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**INTRODUCTION:**

Chronic otitis media is a chronic inflammation of the middle ear cleft which presents with persistent otorrhoea through a perforated tympanic membrane for a period of more than 3 months. To improve the hearing and successful closure of tympanic membrane perforation for cases with retraction and central perforation, two surgical procedures are offered by otologists i.e. cartilage myringoplasty and temporalis fascia myringoplasty. This study conducted at the Department of ENT, Stanley Medical College, Chennai, discusses the effectiveness of these two surgical procedures in terms of hearing improvement, graft uptake, reperforation and retraction of tympanic membrane in carefully selected patients in inactive cases of chronic otitis media with retraction and central perforation.

PAGE: 2 OF 86

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11	Manuel Bernal-Sprekel...		<1%

## ENDOSCOPIC CARTILAGE MYRINGOPLASTY

	HOSPITAL NO.	AGE	SEX	PRE-OP AUDIOGRAM PTA IN dB	POST-OP AUDIOGRAM AT 3 <sup>RD</sup> MONTH PTA IN dB	REPERFORATION
1.	346060	28	F	50	30	NO
2.	052940	58	M	46	25	NO
3.	465452	61	M	48	32	NO
4.	466055	48	F	44	28	NO
5.	452839	37	F	52	25	NO
6.	467047	40	F	38	25	NO
7.	467444	20	M	46	30	NO
8.	412652	42	F	40	25	NO
9.	048009	26	F	45	45	YES
10.	450313	22	M	50	28	NO
11.	480203	32	M	46	30	NO
12.	426686	25	F	40	26	NO
13.	483577	40	F	55	30	NO
14.	031691	45	F	52	32	NO
15.	460930	30	M	48	30	NO
16.	484883	26	F	49	28	NO
17.	487120	51	M	38	24	NO
18.	487885	60	F	48	48	YES
19.	488063	20	M	44	30	NO
20.	483528	35	F	52	32	NO
21.	488835	29	F	45	30	NO
22.	018847	20	M	42	24	NO
23.	492390	21	F	46	30	NO
24.	486945	27	F	50	32	NO
25.	492050	27	M	48	28	NO
26.	104188	46	F	56	30	NO
27.	975263	28	F	53	34	NO
28.	488109	31	M	45	25	NO
29.	496873	41	M	52	32	NO
30.	495157	23	M	56	26	NO

### ENDOSOPIC TEMPORALIS FASCIA GRAFT MYRINGOPLASTY

S. NO	HOSPITAL NO.	AGE	SEX	PRE-OP AUDIOGRAM PTA IN dB	POST-OP AUDIOGRAMAT 3 <sup>RD</sup> MONTH PTA IN dB	REPERFORATION
1.	489114	47	M	45	26	NO
2.	048658	28	F	50	24	NO
3.	500145	27	M	56	30	NO
4.	500007	49	M	58	36	NO
5.	057293	35	M	48	48	YES
6.	490672	49	M	53	30	NO
7.	115657	51	M	40	25	NO
8.	494654	29	M	46	24	NO
9.	304624	22	F	39	24	NO
10.	023509	51	M	49	30	NO
11.	510640	52	M	55	55	YES
12.	510699	58	M	46	46	YES
13.	370725	39	M	50	25	NO
14.	050878	25	M	40	24	NO
15.	000581	37	M	52	30	NO
16.	509900	26	F	46	46	YES
17.	486621	27	M	45	28	NO
18.	001195	45	M	50	29	NO
19.	509134	28	F	46	30	NO
20.	099025	49	F	52	52	YES
21.	002330	29	F	45	26	NO
22.	337231	28	F	50	30	NO
23.	103485	40	M	49	28	NO
24.	634773	34	F	54	32	NO
25.	310245	27	F	48	30	NO
26.	027374	30	M	44	24	NO
27.	011889	28	F	50	30	NO
28.	021186	28	M	46	46	YES
29.	034274	22	M	53	30	NO
30.	048859	37	M	45	25	NO